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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/576,023	04/17/2006	Kimiaki Toshikiyo	P29771	9379

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EXAMINER	
TEJANO, DWIGHT ALEX C	
ART UNIT	**PAPER NUMBER**
2622	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/576,023	TOSHIKIYO, KIMIAKI	
	Examiner	Art Unit	
	Dwight Alex C. Tejano	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 August 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 07 August 2009 have been fully considered but they are not persuasive.

Regarding the traversal of the prior art rejections based on reference Meyers, Applicant's main argument asserts that Meyers fails to teach that the "position at which an effective refractive distribution of a corresponding light-collector is a maximum value is displaced from a central axis of a corresponding light receiver toward the center of the plane."

The Examiner respectfully disagrees.

The nature of the diffractive lenslets is such that, at the central section of the lenslet array, the central points of the lenslets are in linear conjunction with the central point of the pixels and, toward the periphery of the lenslet array, the central points of the lenslets are shifted so as to bend the oblique-angled incident light toward the center of the pixel.

This property is shown in Meyers in the example of Fig. 2. In the center of the plane (center section of Fig. 2), the position at which an effective refractive distribution of a corresponding light collection is a maximum value matches a central axis of the light-receiver (light in a straight direction, perpendicular to the imaging array.) Fig. 3A shows the incident light in light with the mechanical optical axis (14.)

Similarly, toward the periphery of the plane, the position at which an effective refractive distribution is at a maximum (i.e., position for most collected incident light) is shifted such that the oblique-angled light becomes the most collected light. This light, as illustrated in Fig. 2, 4A, and 5A, is bent toward the center of the plane in line with the mechanical optical axis. However, the opening (area between 16) at which the highest level of collected light is positioned as shifted from the central axis of the pixels.

As such, Meyers discloses the limitations of the claim and the rejection stands.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 9 and 11 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 12 and 14 of copending Application No. 10/576,273. Although the conflicting claims are not identical, they are not patentably distinct from each other because the additional limitations present in the instant application are obvious results of efficient use of digital camera components.

This is a provisional obviousness-type double patenting rejection.

Claim 9 of the present application presents a solid-state imaging apparatus comprising arranged unit pixels, each of which includes a light-collector and a light-receiver, wherein the light-collector comprises the limitations of:

a) a substrate into which the incident light is incident; and

b) above said substrate, a plurality of light-transmitting films formed in a region into which the incident light is incident

c) wherein said light-transmitting film forms a zone in which a width of each zone is equal to or shorter than a wavelength of the incident light

d) each zone shares a center point which is located at a position displaced from the center of said device

e) the plurality of said light-transmitting films form an effective refractive index distribution

f) wherein in a unit pixel among said unit pixels, which is located at a center of a plane on which said unit pixels are formed, a position at which an effective refractive distribution of a corresponding light collector is a maximum value matches a central axis of a corresponding light receiver, and

g) wherein in a unit pixel among said unit pixels which is located at a periphery of the plane, a position at which the effective refractive distribution of a corresponding light-collector is a maximum value is displaced from the central axis of a corresponding light-receiver toward the center of the plane.

Claim 12 of copending Application No. 10/576,273 (hereafter, "273") reads directly on limitations a – c and e. However, the claims of 273 as the presently read do not mention limitation d. Despite this, the addition of limitation d would be obvious to one of ordinary skill in the art, as this would be easiest logical step for why one would

include a diffractive element in an image pickup apparatus in the first place. More plainly, a diffractive optical element (in this case, the light-transmitting film) is designed to bend light of certain wavelengths at certain angles toward specific locations. Because of the sensitivities of the image pixel array, it would be best for light to be bent toward the center of the pixel for maximum light collection efficiency. Therefore, it would be obvious that, if light-transmitting films are present, that their individual zones would be configured to share a center point located at the position displaced from the center. The only other option would be to direct light *away* from the imaging device, which would effectively invalidate the device itself.

Additionally, while the wording does not precisely match those of limitations f and g, it is clear that the limitations ultimately address the same thing. The claim of 273 reads "for each unit pixel located in a center of a plane on which said unit pixels are formed, a central axis of said light receiver matches a central axis of said light collector."

This limitation reads upon limitation f of the present invention. It is inherent that, in the center of a plane of unit pixels, when the position where an effective refractive distribution of a corresponding light collector is at a maximum matches the central axis of a corresponding light receiver, then this must also be the point where the central axis of the light receiver matches the central axis of the light collector. Because at the center of the plane, the point where the effective refractive distribution is at a maximum is when the central axes of the two elements match.

The last limitation of the claim in 273 reads upon limitation g for the same rationale as limitation f, as applied to the pixels on the periphery of the plane displaced from the central axis toward the center of the plane.

Claim 11 of the present application is read directly upon by claim 14 of 273.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 2 – 5 and 9 – 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Meyers (EP 0809124 A2.)

Regarding **claim 9**, Meyers discloses a solid-state imaging apparatus comprising arranged unit pixels (R, G, B, Fig. 2), each of which includes a light collector (diffractive/refractive lenslet array) and a light receiver (individual pixels.) More specifically to the present application, Meyers discloses that the light-collector comprises: a substrate into which the incident light is incident (photosensitive imaging array, 30) and a plurality of light transmitting films (lenslets, 12) formed in a region in which the incident light is incident above said substrate (lenslet array, 10.)

The limitation wherein each light-transmitting film forms a zone in which a width of each zone is equal to or shorter than a wavelength of the incident light is inherently present in Meyers. The lenslet array is made of achromatized refractive/defractive lenslets [p. 3, ln. 46], meaning that lenslet array has been fabricated in such a way such that there are zones (in this case, the area within the concentric circles) that become progressively smaller as the circles expand from the local center (Fig. 1.) This spacing defines a zone width that directs the incident light in a certain manner – in this case, toward the photosensitive site [p. 4, ln. 43 – 55.] Although this is not explicitly stated, these zone widths must be equal to or shorter than a wavelength of the incident light because that is how diffraction grated lenses are formed (for example, see Shiono, et al., US 5,742,433, Figs. 4, 5 or Kobayashi, US 2002/0001066, Figs. 5A/B.) Because this property is inherent in refractive lenslets, this limitation is considered disclosed by Meyers

Additionally, Meyers discloses that each zone shares a center point which is located a position displaced from the center of said device (R/G/B pixels, Fig. 2) and that the plurality of light transmitting films form an effective refractive index distribution (p. 5, ln. 5, equation dependent on incident wavelength.)

Moreover, Meyers discloses that in a unit pixel, among said unit pixels, which is located in a center of a plane on which said unit pixels are formed (photosensitive imaging array, 30), a position at which an effective refractive distribution of a corresponding light collector is a maximum value (on-axis, Fig. 3A) matches a central

axis of a corresponding light receiver (incident light matches mechanical optical axis, 14.)

Finally, Meyers discloses that in a unit pixel, among said unit pixels, which is located in a periphery of a plane on which said unit pixels are formed (photosensitive imaging array, 30), a position at which an effective refractive distribution of a corresponding light collector is a maximum value (Figs. 4A and 5A) is displaced from the central axis (position is shifted from mechanical optical axis, 14) of a corresponding light receiver toward the center of the plane (light bent toward pixels in plane center, Fig. 2, see Response to Arguments.)

Regarding **claim 2**, Meyers meets the limitations of claim 9, as discussed above. Furthermore, Meyers discloses that the incident light is collected in a center plane made of said light transmitting films and that the incident light is incident at an angle asymmetrical to the center of the plane made of said plurality of light-transmitting films (Fig. 2)

Regarding **claims 3 and 4**, Meyers discloses the limitations of claim 9, as discussed previously. However, Meyers does not specifically disclose an amount of phase change of incident light approximately according to the equation:

$$\phi(x) = Ax^2 + Bx\sin(\theta) + 2m\pi \ .$$

Meyers also does not specifically disclose a difference of refractive indices according to the equation:

$$\Delta n(x) = \Delta n_{\max}\left[\frac{\phi(x)}{2\pi} + C\right].$$

Despite these, it is assumed that, when a semiconductor compound recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Because the lenslets are diffractive/refractive in nature, adapted to direct incident light upon a specific point in the substrate, they meet this requirement. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of anticipation has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977.)

As such, these equations are considered inherently present in Meyers.

Regarding **claim 5**, Meyers discloses that the heights of the plurality of light transmitting films (lenslets, 12) are constant in a direction normal to said plurality of light transmitting film (Fig. 2.)

As to **claim 10**, Meyers meets the limitations of claim 9 and further discloses that there are off-centered light-transmitting films (the full lenslet array with multiple off-centered lenslet segments, Fig. 1) is also formed in an area shared by one light-collector and another light-collector in an adjacent unit pixel (multiple pixels, 20, within a single lenslet segment, Fig. 2.)

As to **claim 11**, Meyers meets all of the limitations of claim 9, as earlier discussed. Additionally, Meyers discloses a first unit pixel device and a first light-collector (20, “R”) for a first color light out of incident light (red.) Meyers continues disclosing a second unit pixel and a second light-collector (20, “G") for a second color light which has a typical wavelength that is different from a typical wavelength of the first color light (red and green have different wavelengths). Finally, the focal length of the second color is equal to a focal length of the first color light in said first light-collecting devices (Figs. 3A, 4A, 5A.)

As to **claim 12**, Meyers meets the limitations of claim 9 and further discloses that the focal point is set at a predetermined position by controlling an effective refractive index distribution of said light-transmitting film (p. 5, ln. 10.)

As to **claim 13**, Meyers meets the limitations of claim 9 and further teaches that each of the unit pixels further includes a light-collecting lens (lenslets, 12) on a light-outgoing side of the said light-collector.

As to **claim 14**, Meyers meets the limitations of claim 9 and furthermore illustrates in Fig. 1 that an effective refractive index distribution of said light-transmitting film is different between light-collectors of said unit pixels located at the center of a plane on which said unit pixels are formed and light-collectors of said unit pixels located

at the periphery of the plane. Meyers also discloses this in the tables reflecting the adjusting values dependent on the degree field (Example A, B, C.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meyers in view of Dellwo, et al. (US 7,390,532 B2.)

Regarding **claims 6, 7 and 8**, Meyers meets all of the limitations present in claim 1, as discussed in a previous section. However, Meyers fails to disclose the light-transmitting films including one of the compounds claimed in claims 6, 7, or 8. Despite this, the Examiner maintains that it was well known in the art to include these compounds in the creation of the lenslets, as disclosed by Dellwo, et al. (hereafter, "Dellwo.")

Dellwo discusses a method for the production of optical elements with gradient structures. In his method, he discloses that the optical elements (light-transmitting films) includes one of TiO_2, ZrO_3, Nb_2O_5, Ta_2O_5, Si_3N_4, and Si_2N_3 (c.9, ln. 1 – 14.) He also discloses that the optical elements includes one of SiO_2 doped with B or P (Boro-Phospho Silicated Glass) and Teraethoxy Silane (c. 7, ln. 51 – 64.) Finally, Dellwo

discloses the optical element including one of benzocyclobutene, polymethacrylate, polyamide, and polyimide (c. 6, ln. 13 – 31.)

Because the lenslets of the lenslet array are themselves "optical elements with a gradient structure" – that is, a diffractive gradient optical element – it would be obvious to one of ordinary skill in the art that such a process as defined by Dellwo, as doing so would allow one to manufacture the lenslets and, further, lenslet array used in the invention disclosed by Meyers.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwight Alex C. Tejano whose telephone number is (571) 270-7200. The examiner can normally be reached on Monday through Friday 10:00-6:00 with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David L. Ometz/
Supervisory Patent Examiner, Art Unit 2622

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Examiner, Art Unit 2622